slowly and therefore intermediate between types A and B.

Some important physical and meteorological significance must be attached to the indraft of air to points in front of the center and not to the center itself. The trajectories representing the inflowing air may be continued, in the particular case referred to, for distances beyond the region of circular isobars, and it would therefore appear that these strong currents are not primarily due to the previous existence of a center of disturbance, but to some more dominant cause which directs their trajectories to points successively approached by the center of circulation. It may be noticed that the direction of motion of the center with regard to the motion of these dominant winds stands in the relation of west to southwest or of southwest to south, and possibly the inblowing wind may be the determining cause of the motion of the barometric minimum.

The details of the storm of February 26–27, 1903, for which the trajectories were drawn are given in a paper read before the Royal Meteorological Society on June 17, 1903.

THE METEOROLOGICAL WORK OF THE EXPEDITION TO THE BAHAMAS.[1]

By Dr. O. L. Fassig, Section Director.

Leaving Baltimore June 1 on the two-masted schooner *W. H. Van Name*, with the scientific expedition sent out under the auspices of the Baltimore Geographical Society, I arrived at Nassau, Bahama Islands, on June 17. Storms, calms, and head winds marked the entire voyage outward, making it difficult to secure reliable instrumental records of the weather and temperature of the water. However, some interesting results were obtained which will be discussed in a separate report. Arriving at Nassau, a thermograph, barograph, hydrograph, and pluviograph were installed at the cable office by the courtesy of Mr. P. H. Burns, superintendent of the Bahamas cable. Mr. Burns also kindly attended to these self-recording instruments during my absence from Nassau, enabling me to obtain continuous records of the temperature, pressure, humidity, and time of occurrence of rain for a period of about thirty days, from June 20 to July 20. From the colonial records I had copied the monthly and annual mean values of meteorological observations for a period of five years.

During my short stay of two weeks at Nassau I succeeded in obtaining some interesting records of temperature, pressure, and humidity of the upper atmosphere by means of the Weather Bureau kite equipment, which I hope will also prove to be of some value in defining the vertical rate of change in atmospheric conditions in these latitudes. Light winds are the rule in the islands during the summer months, and it was only on a few occasions that favorable opportunities were presented for flying kites. However, five ascents were made to elevations varying from 3500 to approximately 8000 feet. The highest elevation was attained by the use of a launch. Steaming into the wind we were enabled to obtain a somewhat increased wind velocity. Apparently the wind velocity decreases rapidly after an elevation of 5000 to 6000 feet, it being difficult to detect any motion in the clouds above the lower cumulus layer. The results will be discussed at the earliest opportunity.

On the return trip, which was made under more favorable conditions than the outward voyage, an interesting series of observations of water temperatures was made from Nassau to Baltimore. While passing through the Gulf Stream the temperature of the water was noted every half hour or oftener. Good records were also obtained by means of the thermograph, barograph, and hydrograph.

In addition to the meteorological duties noted above, a magnetic survey of the islands was made. Declination, dip, and relative intensity were measured on the islands of New Providence, Hog, Watlings, Long, and Abaco. Observations made in past years in these islands included only the element of declination. A self-registering tide gage was also installed by me. The magnetic instruments and tide gage are the property of the United States Coast and Geodetic Survey.

The generous cooperation of the Weather Bureau with the Baltimore Geographical Society has been greatly appreciated by the director of the expedition, and due acknowledgments will be made in the official publications of the results of the expedition.

[1] Under date of August 1, Dr. O. L. Fassig reports his return to Baltimore from the Bahama Island, and gives some idea of the work accomplished.

CLIMATOLOGY OF COSTA RICA.

Communicated by Mr. H. PITTIER, Director, Physical Geographic Institute.

[For tables see the last page of this REVIEW preceding the charts.]

Notes on the weather.—On the Pacific slope the rain was uncommonly scarce, the month showing regular alternations of short periods of two, three, and four days of drought, separated by others of one and two days with moderate rainfall. On the 25th the rain began falling daily and the 28th, 29th, and 31st were marked by heavy showers. In San José, pressure and temperature were about normal, and the relative humidity a little less than the mean. Sunshine, 144 hours against a normal of 119. On the Atlantic slope also there was a scarcity of rain, excepting at a few stations at the foot of the Cordillera and at Turrialba and Paraiso in the Reventagon Valley, where the fall showed an excess. On July 10 a cyclone crossed the plains of Sta. Clara in an E–W direction, causing much damage to the banana plantations.

Notes on earthquakes.—July 23, 7h 20m a. m., slight shock NW–SE, intensity II, duration 3 seconds.

OBSERVATIONS OF SOLAR RADIATION WITH THE ANGSTROM PYRHELIOMETER AT ASHEVILLE AND BLACK MOUNTAIN, N. C.

By Mr. H. H. KIMBALL, Assistant Editor, Monthly Weather Review, dated July, 1903.

The Ångström compensating pyrheliometer, No. 28, used by Davis and Pierce[1] at Providence, R. I., from November, 1901, to September, 1902, was installed by me at Asheville, N. C., on November 8, 1902, in accordance with instructions received from the Chief of Weather Bureau. The point selected for its exposure was on the lawn just south of the Ravenscroft Hotel, near the crest of a ridge running north and south, with a slight dip to the south. The business portion of the town lay to the north and east, and as soft coal was almost the only fuel used the smoke at times became quite dense, particularly with light northerly winds.

The arrangement of circuits was as described by Professor Marvin in the MONTHLY WEATHER REVIEW for October, 1901, Vol. XXIX, p. 456. At first the galvanometer was suspended from the south side of the trunk of a large and nearly branchless locust tree, instead of from the tripod, as shown in fig. 1. Here an unobstructed view of the sun was had from the time it appeared above Beaumont Mountain, about a mile distant, some fifteen minutes after the time of true sunrise, until it set behind mountains nearly 20 miles distant, the tops of which were only one or two degrees above the true horizon. Winds above 20 miles per hour caused such annoying oscillations in the galvanometer that on December 22 it was moved to a post at the southeast corner of the hotel porch, where it was well protected from the prevailing northwest winds; but at noon and again at 4 p. m. the tripod support of the pyrheliometer had to be moved a few feet to avoid the shadow of shade trees.

On December 2, a Pickering polarimeter[2] loaned by Prof. E.

[1] See Monthly Weather Review for June, 1903, p. 275.

[2] For a description of this instrument see Proc. Amer. Acad. of Arts and Sci. N. S. Vol. XIII. Pp. 294–302.